DIEL PERIODICITIES OF FEMALE CALLING AND MALE PHEROMONE ATTRACTION IN *HOLOMELINA AURANTIACA* (LEPIDOPTERA: ARCTIIDAE)[1]

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Introduction

All species in the *Holomelina aurantiaca* (Hübner) sibling species complex probably employ 2-methylheptadecane as a sex attractant pheromone. Males of the generotype, *H. aurantiaca*, and also of *H. immaculata* (Reakirt) and *H. rubicundaria* (Hübner), are strongly attracted to the synthetic compound and this chemical has been identified in extracts of abdomen tips of females of all species in the group (Roelofs and Cardé 1971). This note describes non-synchronous diel periodicities of female calling behavior and male attraction to synthetic pheromone in the field.

Materials and Methods

The procedures employed for laboratory observations of female calling behavior (protrusion of the pheromone-producing gland) and male attraction in the field are the same as Cardé and Roelofs (1973) reported for *H. immaculata*. In general, females were observed at hourly intervals with Scotophase viewing accomplished using a Kodak Wratten filter 29 to eliminate light below 6100 Å. Males were lured to Sectar® I sticky traps (Zoecon Corp.) baited with 1 mg of synthetic 2-methylheptadecane. Traps were checked hourly. The laboratory culture was obtained from material collected in East Haddam, Conn., in June 1970 on a well-drained hillside in about the tenth year of secondary succession. Attraction studies were conducted in the same field. In Connecticut *H. aurantiaca* is bivoltine with adults occurring in June and August.

Results and Discussion

Under controlled conditions of 24°C in a 16:8 light:dark regimen females initiate calling shortly after the start of scotophase, reaching a maximum from 1.0 to 2.5 h and declining until 4.5 h (Fig. 1). In laboratory colonies maintained under these conditions, mating occurs only during this interval. A sibling species, *H. immaculata*, from central New York, under identical environmental conditions possesses a similar cycle with calling commencing after 2.0 h of scotophase and terminating by the 7.5 h (Cardé and Roelofs 1973). These species (both of which use 2-methylheptadecane as a sex attractant pheromone) do not co-occur in either central New York or Connecticut although their

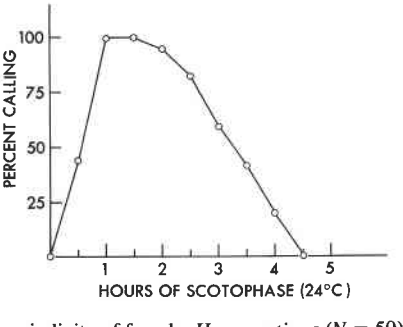

FIG. 1. Calling periodicity of female *H. aurantiaca* ($N = 50$) in the laboratory.

[1]Taken from: R. T. Cardé, Ph.D. Thesis, Cornell University, 1971.

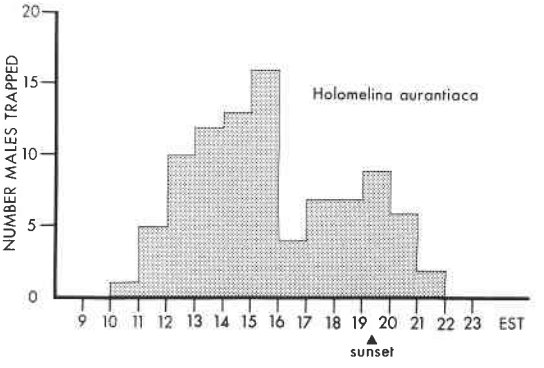

FIG. 2. Field attraction periodicity of wild *H. aurantiaca* males to 2-methylheptadecane in Connecticut. Sunrise was at 0418 and sunset at 1923 (Eastern Standard Time).

distributions overlap at least in southeastern Pennsylvania, central Michigan, and northwestern Illinois. The 24°C observations suggest that the calling intervals of these two species are not sufficiently distinct to effect a great degree of reproductive isolation between contiguous populations. Since daily temperature fluctuations modify the circadian calling rhythm of *H. immaculata* (Cardé and Roelofs 1973) (the effect of temperature on *H. aurantiaca* has not been investigated), the differences noted at 24°C can be expected to be altered somewhat under natural thermoperiod.

The periodicity of *H. aurantiaca* male attraction (Fig. 2) in the field differs markedly from the female's calling interval. Males were lured to 2-methylheptadecane from 1000 to 2200 (Eastern Standard Time). The test was conducted from 0900 8 June to 0900 10 June 1970. In the study area the maxima–minima for these days were 23.9° to 15.0° and 26.7° to 13.9°C, respectively, while for June the mean high was 24.4°C ± 3.3 S.D. and the mean low was 13.9°C ± 3.3 S.D. As the study days were typical of temperatures occurring during the first flight period, *H. aurantiaca* males appear to have a rather broad pheromone response interval. In contrast *H. immaculata* males have a comparatively discrete diel response which is temporally well co-ordinated with the observed female calling periodicity (Cardé and Roelofs 1973).

Since in the Lepidoptera the timing of these events generally has been synchronous, it is noteworthy that the male response interval of *H. aurantiaca* is initiated many hours prior to the onset of the female calling rhythm in the laboratory. The rather unspecific male response interval of *H. aurantiaca* would not pose particular reproductive isolation difficulties in Connecticut as the only co-occurring sibling species, *H. ferruginosa* (Walker), is univoltine and reproductive completely isolated by its July flight period. In areas where *H. aurantiaca* occurs in complete sympatry with sibling species, additional chemical specificity may help effect reproductive isolation (Roelofs and Cardé 1971).

References

Cardé, R. T. and W. L. Roelofs. 1973. Temperature modification of male sex pheromone response and factors affecting female calling in *Holomelina immaculata* (Lepidoptera: Arctiidae). *Can. Ent.* **105**: 1505–1512.

Roelofs, W. and R. Cardé. 1971. Hydrocarbon sex pheromone in tiger moths (Arctiidae). *Science* **171**: 684–686.

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